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Shadow of the Dragon: The Convergence of Myth and Science in Nineteenth Century Paleontological Imagery

Abstract

The dinosaur—as image and concept—is a ubiquitous presence in modern culture. As noted by numerous scholars including W. J. T. Mitchell, it has garnered numerous connotations and meanings over the course of more than two centuries of paleontological exploration and the translation of scientific knowledge into public discourse. In the nineteenth century, as cultural understanding of dinosaurs and the primordial world first began to develop out of nascent scientific inquiry, a process or pattern of convergence between the ancient, mythic figure of the dragon and the new and often controversial concept of prehistoric animals helped to shape the public's conception and acceptance of dinosaurs and their nature. This process, which was accomplished primarily through dinosaur imagery, can be traced historically. Such an investigation reveals that factors including taxonomic manipulation and the power of visual illustration brought the dragon and the dinosaur to a point of cultural convergence. Beginning with the first large-scale replicas of dinosaurs, created for the rebuilt Crystal Palace complex at Sydenham, England under the direction of the noted naturalist Richard Owen, the concept of the dragon was deliberately co-opted into both the literature and the imagery of paleontology. Our twenty-first-century understanding of the dinosaurs that routinely populate our visual and other media is highly informed by this process, which is in itself an important aspect of the history of the prehistoric beast in western culture.

The dragon figures in the earliest traditions of the human race, and crops up again in full force in European mediaeval or even late romance. But in spite of all the manifest absurdities of the dragons of various nations and times, geology reveals to us that there once lived upon this earth reptiles so great and uncouth that we can think of no other but the time-honoured word "dragon" to convey briefly the idea of their monstrous forms and characters.

Reverend N. H. Hutchinson,
Extinct Monsters and *Creatures of Other Days*, 1910[1]

It was a place of dragons: fit only for Saurians, Batrachians, and the like.

"Dragons?"

Yes, dragons: not such as the small, living winged reptiles, that skim from place

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> to place in search of their insect food. . .but downright enormous dragons with bellies as large as tuns and bigger.
>
> William J. Broderip,
> *Zoological Recreations*, 1847[2]

The historical study of late modernity, or the period between the late eighteenth and early twentieth centuries, has long recognized the sweeping changes that were experienced by human society and culture, particularly in the West. These changes are represented by myriad developments in virtually every area of technology, including transportation, communication, medicine and industry, as well as in the various sciences that comprise our understanding of the universe and ourselves. At the same time, they also include broad shifts in the *essence* of this understanding, as society and culture moved further away from knowledge based in myth and superstition, and toward the more fact-based discourse on the nature of reality that had begun with the Enlightenment. Some, but not all, of these shifts involved outright rejection of older, outmoded ideas and concepts; occasionally, however, historical research can reveal instances and patterns that demonstrate a more complex relationship between the myths of the past and the science of the present.

Since the nineteenth century and the advent of paleontological and evolutionary science, Western culture has evidenced an unflagging fascination with concepts and themes of the primordial, particularly where such ideas are expressed as images. In the twenty-first century the dinosaur image has become ubiquitous; our visual entertainments, in particular, have for decades depicted prehistoric monsters as the raging terror of time travelers, despoilers of lost worlds and overzealous spelunkers. While palaeontology and its related scientific discourses have steadily broadened our clinical understanding of the dinosaurs and their world, our cultural understanding has built a rich mythology around this narrativized, collective desire to access the primordial and its ferocious beasts. Further, while this recent mythology is a purely twentieth-century one in which men of civilization are pitted against voracious prehistoric monsters sporting scales, claws, fangs and even wings, such fearsome features may be informed by an earlier understanding of just what dinosaurs are, and what they mean. Tracking the most distant history of dinosaur imagery reveals an arena in which myth and science coalesce.

My examination of this phenomenon focuses on the relationship between the dragon images that have followed human culture from its origins and the dinosaur imagery that we have developed only over the last two centuries. This relationship has too often been dismissed by cultural scholars such as W.J.T. Mitchell who, in his somewhat provocatively titled *The Last Dinosaur Book*, ultimately finds any specific cultural connection between the dragon and the dinosaur to be untraceable, and in any case insignificant. Referring to the cultural importance of the latter, he goes so far as to say, "Big, fierce, extinct reptiles: that's all there is to it."[3] His argument echoes that of Noël Carroll who, in speaking specifically of 1933's *King Kong*, finds that

> dinosaurs do not belong to the same symbolic species as dragons. Dragons . . . are fusion figures, condensing metaphysical forces such as earth, air, fire and water into one composite entity. Dinosaurs, on the other hand, are not composite

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> creatures and the ideas we associate with them are inextricably bound up with our ideas of the prehistoric.[4]

On this singular point, I find that Mitchell and Carroll are mistaken. An important and intentional cultural connection between the dragon and the dinosaur can actually be plotted historically. In this article I will show how the patterns of this connection can be traced in large part to a single, seminal event—the construction of life-sized replicas of several species of "extinct animals" for the gardens at the rebuilt Crystal Palace complex at Sydenham, which opened in 1854.

At the forefront of this event was the remarkably visible figure of Professor Richard Owen, Conservator at the Hunterian Museum in London. Biographer Nicolaas Rupke notes that Owen was, at the time, one of the most important naturalists in Britain, and much more than a rising star in both the scientific arena and the public eye. 1851, the year of the Great Exhibition in Hyde Park, was for Professor Owen an *annus mirabilis*:[5] In that year the professor delivered one of his most important lectures on natural history, in which he described the fossil remains of the megatherium, a species of giant sloth; he was "[o]ffered knighthood in the Order of Merit of the King of Prussia,"[6] and given as a residence a house in Kew that had formerly served for the King of Hanover; he was awarded the Copley Medal of the Royal Society; "encouraged to apply for Charles König's position as curator at the British Museum";[7] and he was appointed a jury chairman for the Great Exhibition, to be held in the newly constructed Crystal Palace. A decade earlier Owen had forcefully secured his place in the annals of British Natural History when he introduced the extinct taxonomic order *Dinosauria*, of which only three specimens—Iguanodon, Megalosaurus and Hylaeosaurus—were then known from the fossil record.[8]

As many scholars have noted with regard to Owen's taxonomy, there was no knowledge of "dinosaurs" before 1840, and in western public consciousness there was no primordial world before the late eighteenth century and the first modern discoveries of fossilized dinosaur remains. Because of this, we can see the entire history of primordial imagery in modern times, and quite clearly. In connecting the dragon to the dinosaur, one need merely examine how Owen and his fellow scientists, abetted by artists, theologians and the press, co-opted the concept of the dragon and its related imagery into the emergent science of palaeontology. By doing so we can see how mythic concepts—including images, terminology and overall themes—were incorporated into scientific discourse as such discourse was disseminated to a larger nineteenth and twentieth century public, both in Owen's England and—as the fossil race spread across the Atlantic—in the Americas. With close examination, we find the dragon-to-dinosaur "process"—anchored by Owen and the Sydenham project—was no accident, as suggested by Mitchell. It was a deliberate progression that allowed the primordial image to emerge in the modern era, contributing to the public obsession with prehistoric visions that continues today.

The Sea Serpent Killer

Not all of Owen's celebrity came to him because of his discoveries, or his work on taxonomic classification. Beginning in 1848, Owen—who was already famous (or infamous, depending on who you ask) for his contentious nature and

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his jealous approach to scientific inquiry[9]—would find himself doing intellectual battle in the pages not only of science journals but also of the popular press. The subject—one that would continue to attract public attention for many years—was the Great Sea Serpent.[10]

Sightings of sea serpents go back in the historical record to ancient times; the modern sea serpent, however, is considered by many to have been first reported in 1734 by Hans Egede, a Norwegian pastor conducting missionary work in Greenland.[11] His description would come to fit what by the mid-nineteenth century was referred to formally as "The Great Sea Serpent":

> This monster was of so huge a Size, that coming out of the Water, its Head reached as high as the Mast-Head; its Body was as bulky as the Ship, and three or four times as long. It had a long pointed Snout, and spouted like a Whale-Fish; great broad Paws, and the Body seemed covered with Shell work, its skin very rugged and uneven. The under Part of its Body was shaped like an enormous huge Serpent, and when it dived again under Water, it plunged backwards into the Sea, and so raised its Tail aloft, which seemed a whole Ship's Length distant from the bulkiest part of the Body.[12]

A similar sighting was reported in 1746 at Bergen, in Norway, but reports remained scattered and vague until the Great Sea Serpent controversy in New England in 1817. After numerous sightings,

> [o]n August 18th, 1817, the Linnean Society of Boston formed a committee "for the purpose of collecting any evidence which may exist respecting a remarkable animal, denominated a *Sea Serpent*, reported to have been seen in and near the Harbour of Gloucester." (their italics)[13]

The committee created a standardized questionnaire for reporting witnesses, but after the initial rash of sightings few more were forthcoming.

While some scattered reports made the papers over the three decades after the American sightings, it was the 1848 report of Captain M'Quhae, of H.M. Corvette *Deadalus*, that brought Professor Owen to grips with the serpent. The official naval report made by the captain has been "lost", but survives in the form of a letter from the Captain to the *Times* of London, published on October 13, 1848:[14]

> On our attention being called to the object it was discovered to be an enormous serpent, with head and shoulders kept about four feet constantly above the surface of the sea, and as nearly as we could approximate by comparing it with the length of what our maintopsail yard would show in the water, there was at the very least 60 feet of the animal *à fleur d' eau*, no portion of which was, to our perception, used in propelling it through the water, either by vertical or horizontal undulation. It passed rapidly, but so close under our lee quarter, that had it been a man of my acquaintance I should have easily recognised his features with the naked eye . . . The diameter of the serpent was about 15 or 16 inches behind the head, which was, without any doubt, that of a snake, and it was never, during the 20 minutes that it continued in sight of our glasses, once below the surface of the water; its colour a dark brown, with yellowish white about the throat. It had no fins, but something like a mane of a horse, or rather a bunch of seaweed, washed about its back.

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The attention of the public was instantly riveted by the story.[15] For one thing, this was the first known report of the Sea Serpent in the southern hemisphere (the sighting was reported to have occurred in the waters between the Cape of Good Hope and St. Helena, off the coast of South Africa).[16] Also significant was the role of the ship's captain in the then-established process for determining the veracity of sea-serpent sightings. As Gould opines:

> M'Quhae's honesty was not—and obviously, could not be—seriously called into question. That a British post-captain, paying-off his ship and desirous of further employment, should deliberately go out of his way to embroil himself with the Board of Admiralty by playing off upon them a purposeless hoax (requiring, for even a short-lived success, the active co-operation of several of his officers, and the tacit complicity of his whole ship's company) was not merely improbable—it was frankly unthinkable.[17]

Ultimately it was this factor that drew Owen into the controversy. As a naturalist, the professor took a somewhat jealous offence at a process of verification that was essentially a *legal* rather than scientific one. If a witness were considered unimpeachable (by an adjudicating body such as the Admiralty, as well as in the public sphere), the account was resolved to be true, empirical evidence or no. For example, Rupke cites the *Winchester Review*, which "in an impassioned defence of the reality of 'The Great Sea Serpent,' plainly placed the controversy in the context of a struggle for hegemony in matters of evidence. . .[and] vehemently defended the validity of the rational mode of estimating the value of evidence by the trustworthiness of the witness—long since admitted in law.'"[18] For Owen, who had built his professional reputation on the science of comparative anatomy and careful examination of the fossil record, such a situation was intolerable, particularly where it supported supposed "knowledge" of the existence of mythic beasts. Such views directly contrasted the religiously inspired conclusions of Owen and others, that extinct animals had become so prior to the current state of divine creation, and that there was no evolutionary link between the primordial and the present—or the future, for that matter.[19]

The Great Sea Serpent controversy may also have raised Owen's hackles because it spilled (or was spilt) over into his own field of comparative anatomy and fossil reconstruction. In the same year as the *Deadalus* report, an enterprising fellow named Albert Koch leased a display space in London and presented to large paying audiences the skeleton of a "prehistoric sea monster," which he had constructed from the bones of various animals imported from America. The hoax was dispelled by Owen's contemporary, the naturalist Gideon Mantell, but the popularity and profitability of the oversized fake would surely have displeased Owen himself, whose prestige in the field had by this point caused him to be dubbed (either admiringly or derogatorily) "the British Cuvier," after Georges Cuvier, the French naturalist and geologist who began the study of fossilized remains.[20] This affront to his work and intellect, in addition to his own scientific and theological convictions, made Owen no friend of the Great Sea Serpent; he waged his battle against the beast for years, even as he and others worked to advance the nascent science of paleontology, which would continue to find detractors in the church.

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From the beginning of the nineteenth century, the theological controversy over fossils and extinct animals was not so much about monsters as it was about time. As noted by Stephen Prickett in his study of *Victorian Fantasy*, university students in the mid-nineteenth century were still taught the time and date of creation, determined "with remarkable precision" by Archbishop Ussher in the seventeenth century: 9 a.m. on October 23, 4004 B.C.[21] The very idea of extinct animals, introduced by Cuvier in the first years of the nineteenth century, set this teaching on its head—particularly when the scientific evidence indicated that they had lived long, long before the biblical flood in 2348 B.C.[22] The effect of such ideas on the public would surely have been galvanizing. Imagine waking from one's cozy six thousand years of history to the sudden realization that vast ages, hitherto undreamed of, had existed in a past that stretched back an unthinkable distance; such ideas were bound to cause a little temporal vertigo, and they met with vigorous resistance, both in the theological community and among the general populace.

Conceptually, such a realization, or even scientific suspicion, is analogous to the discovery that new and strange lands lie on the other side of an ocean previously taken for the end of the world. *Tempus incognitum*: the discovery of geologic time and the remains of its inhabitants opened up vistas of vast temporal frontiers, where the cultural fascination with the strange lands of the primordial was born.

Importantly, the transition of this fascination, from a small number of geologists and zoologists who examined fossil evidence in the early part of the nineteenth century to the larger arena of public awareness that influenced the artists and audiences of the twentieth, was accomplished primarily through imagery. As Martin J. S. Rudwick finds, early illustrations of what was thought in scientific circles to be the appearance of the primordial environment were soon appearing in works by "authors. . .who were quick to see their potential for capturing the imagination of the general reader and, not least, of the young."[23] Of illustrations circulated within the scientific community, such as Henry De la Beche's *Duria antiquior* ("ancient Dorset," 1830, which Hugh Torrens calls "the real start to proper scientific reconstructions of the past,")[24] and August Goldfuss's *Jura Formation* (1831), Rudwick notes that "within a few years. . .adaptations of them had reached a far wider public" through the illustrated publications of the day.[25]

The effect of the image on understanding—particularly *public* understanding—of the primordial world is, as noted by T. Lingham-Soliar, a long tradition that stems from this early period:

> Paleontology sits in a unique position. Surely in no other subject are science and art so intrinsically interwoven and interdependent; for instance, no amount of description conveys the awesomeness of a single reconstruction of *Tyrannosaurus rex*. The awe that it invokes is in great part dependent on its reality—a confirmation of our obsessive belief that truth is stranger than fiction.[26]

By "its reality," I take Lingham-Soliar to mean the combination of visual presence and scientific assurance that allow viewers to experience creatures that are otherwise only accessible in an internal (learned) context. In other words, we can read about dinosaurs and reach a certain level of understanding about what they were and how they lived; seeing, however, is believing.

In the vigorous public debate with both Captain M'Quhae and his supporters, Owen suggested various known sea-going creatures that could have been

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mistaken for "his eminence." The professor remained steadfast in his dismissal of the beast; during the decades following the initial controversy, he "built up an extensive file of 'Sea-Serpentiana'"[27] to be consulted when he received one of the occasional queries on the matter that continued to come his way. Owen also penned the "Sea-Serpent" entry for the 1867 *Dictionary of Science*.[28] Such consultations, and his continued dismissal of the phenomenon, finally earned Owen the epithet "the sea-serpent killer," bestowed by none other than the Prince Consort.[29] One factor that consistently stands out in the many monographs, letters and essays penned by the Professor on the subject of the Sea-Serpent is the extreme precision which he brings to his descriptions (of, for example, the elephant seal that Owen suggested was seen by the *Deadalus* crew) and terminology. It is this factor of professional precision that brings into question one puzzling taxonomic anomaly that he would unveil with the reconstructions of extinct animals at Sydenham.

Gothic Dinosaurs

It is important to note that the first three known forms of dinosaur were a minority among the Sydenham statuary, which included the Mososaurus, two species of Pterodactyl, the Iguanodon, the Hylaeosaurus, the Megalosaurus, the Teleosaurus, two of Icthyosaurus, three of Plesiosaurus, two of Labyrinthodon, and the Dicynodon. By 1853 Owen's taxonomic order had not yet been appropriated into mainstream usage, let alone come to serve as a general reference to various extinct reptilian creatures discovered through fossil remains. Nearly all contemporary media references refer to the statues under the generic umbrella of "extinct animals" when not naming specific orders and species, and the latter designations were normally limited to the scientific arena. The statuary, additionally, raised to a new level the value placed by the public on such primordial display. Rupke points out that in the immediate wake of the statuary's unveiling, "[a]ll around the Western world, metropolitan, provincial and university museums found legitimacy in the possession of the actual bones of the fossil monsters or their casts."[30] Rupke further notes that Owen's own writings betray his awareness of the "iconic value" of his recreations with regard to museum display.[31] He knew that the public would turn out for his "extinct animals," and he was more than happy to be recognized as "the officer to whom mainly the public are indebted for this storehouse of the national treasures of natural history."[32]

The Sydenham project, which Mitchell calls "[t]he first public 'revivifying' of the dinosaur,"[33] is significant precisely because it brought the dinosaur image out of the anatomic collection (or off of the printed page) and into the open air and the public eye. In the wake of the enormous importance of the Great Exhibition itself, and for the first time, men, women and children of all educational levels could walk around the gardens and gaze at reproductions of what were thought not only to be the real shape (as demonstrated by earlier illustrated reconstructions) but the size and presence of dinosaurs, and be struck by the scientific assurance that the beasts had once been truly, monstrously alive. This was the first modern apex of the "awe" of visual presence for the primordial beast. After the Great Exhibition, the Crystal Palace outside London continued to attract throngs of visitors well into the twentieth century;[34] when it finally burned to the ground

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in 1936, only those prehistoric statues survived. In fact, you can visit them today; a little less awe-inspiring, perhaps, than in 1854, but then we've come to see a great deal more of dinosaurs in the interim.

In keeping with the educational tone intended for the palace and gardens by its designers, the statues were placed on an island in one of the lakes according to the geologic stratum at which their fossil remains occur.[35] An 1882 popular guide to the Sydenham complex describes:

> the Lake, containing three islands, the two largest wholly occupied by life-sized models of the gigantic animals of the early geological periods of the world. It is here that one of the most original features of the Crystal Palace Company's grand plan of visual education has been carried out. There, all the leading features of Geology are found displayed, in so practical and popular a manner, that a child may discern the characteristic points of that truly useful branch of the history of nature.[36]

The figures were sculpted by the artistically gifted naturalist B. Waterhouse Hawkins at the direction of Owen. For visitors to the exhibit, Owen himself wrote the definitive guide, entitled "Geology and Inhabitants of the Ancient World."[37] In it, each of the reconstructed creatures receives a description and a translation of its name, for example "labyrinth tooth" for Labyrinthodon.

All of these are presented in strictly scientific terms, except one. While translating the Greek words *pteron* (wing) and *dactylos* (finger), the professor slips a little something extra into the taxonomy:

> *Nos. 2 and 3 are restorations of a flying reptile or dragon, called Pterodactyle.*[38]

Why would Owen make the name of a mythic creature part of the taxonomic category for his extinct animal? Importantly, he doesn't explain: the text contains no statement to the effect that a Pterodactyl resembles a dragon, or is in any other way "dragonlike." Given the Professor's academic habits, one can not assume this was an accident, since defining the characteristics of *mythic* beasts was, after all, exactly that in which Owen was *not* interested.

Along with Rupke, several writers have noted what Dennis R. Dean calls Owen's "devious and habitually underhanded tactics in scientific disputes," which he adds are "now well documented."[39] Adrian Desmond has in this regard concluded that Owen's naming of the order *Dinosauria* was itself a painstakingly calculated ideological ploy, intentionally designed to refute Lamarckian evolutionary theory, which depended on a progression of life forms from the less to the more complex.[40] Kevin Padian has noted the same sort of skullduggery in the case of the debate over the nature of Pterodactyls, which Owen insisted were lizards so as to combat any ideas about birds having evolved from them (he was inadvertently right in this: birds are descended not from pterodactyls but from small theropod dinosaurs).[41] Padian further notes that this type of taxonomic trickery required careful, detailed balancing of physiological factors which might—or might not—help Owen's arguments. Owen was famous for arguing over the minutia of terminology. So why "dragon"?

It is possible that Owen was inspired in this regard by existing references to prehistoric creatures as "dragons," particularly Robert Hawkins's 1840 work on

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Ichthyosaurus and Plesiosaurus, *The Book of the Great Sea Dragons*, which delivers the analogy by the shovelful:

> **ICHTHYOSAURI**
> GENUS OLIGOSTINUS
>
> I. Frontispiece The Sea-Dragons as they lived. By Martin.
> II. Dragon from Lyme Regis. Discovered in 1835.
> III. Huge Dragon from Lyme Regis. 1832.
> IV. Sternal Remains of a Dragon from Lyme Regis.
> V. Head of a Dragon from Lyme Regis.[42]

And so on. With its convoluted (even weird) phrasing and constant references to Christian theology, the book might have been well received by many of those who sought to reconcile evidence of extinct animals with scripture; still, the tone of the prose takes a pretty heavy hand, especially for the scientific professional of the day, and links "sea dragons" and their ilk not only to an earlier stage of creation, but to the source of evil:

> [O]ther Dives than Belial have tried their black art upon matter with a success commensurate and as cunning. Plesiosauri are their handiwork: if the Old Serpent himself did not shed his own teeth upon the ground, out of which these Sea-Dragons, armed with all the virility of Evil instant sprung. Emulous, Satan seems to have been thrice seized, generating Horrors commanding, and realizing a teeming Spawn fitted for the lowest Abysm of Chaos.[43]

"Wide over the desolate Seas," envisions Hawkins of the antediluvian world, "warring Dragons innumerable and hideous, enacting Perdition."[44] His characterization of the Pterodactyl (which qualifies for a brief mention in his book as he believes it "to have lived chiefly in the sea"[45]) reads in part:

> Squatting his lean haunches upon rocks outfitting over the black Abysses, or over or under the waters, this monster dragon lived through the many weary ages, a sooty Fiend dolorous and Lord of the dead wastes of the briny Sea.[46]

Even if Owen's sentiments fell at times on the theological side of the naturalist debate, he was not known to end his papers or lectures with prayer.[47] He sought to show that extinct animals represented a global ecology that was entirely separate from contemporary life, not to vilify them or characterize them as monstrous in some esoteric or dogmatic sense. Owen's approach at Sydenham, based on his battle with the Great Sea Serpent, was comparatively concise, and eminently scientific, as if to say: If there is such a thing as a dragon, then it is here on my island—tracked through the geological record, painstakingly extracted, analyzed, extrapolated and reconstructed by comparative anatomy, its appearance in life theorized by the leading expert in the field.

An article in the *Times* of London from September 14, 1852, previews the garden complex for an awaiting public, noting:

> [T]he winter-garden is, of course, the special object of Sir Joseph Paxton's solicitude, who will, no doubt, do everything that a knight can to bring down into the

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> 19th century, and within a few minutes' drive of London, the fabled gardens of the Hesperides, without the dragon.[48]

The *Times* got it wrong. It *was* there, after all. With his taxonomic sleight of hand, distributed to an eager public, Owen did not debunk or even reinvent the dragon; in his zeal to promote scientific analysis over myths and hearsay, he co-opted it.

A more colorful reference to antediluvian dragons is found in William J. Broderip's *Zoological Recreations*, quoted at the beginning of this essay. The book, a study of skeletal reconstructions through comparative anatomy, is dedicated to Owen, and with good reason. Until his death in 1859, Broderip was perhaps Owen's closest friend, and had worked with him for years. Their friendship seems at times to have spilled over into work credited to Broderip, but in fact penned by Owen, as with a summary of the latter's published works for Lockhart's *Quarterly Review* in 1851:

> Initially, it was proposed that Broderip write the essay, "but I found," Owen confided, "it would be easier and perhaps clearer if I did it myself. The list astonishes me! I wonder how Lockhart will manage."[49]

This combination of self-promotion and subterfuge was not, as noted by Rupke, uncommon for the professor, who at times took to writing flatteringly about himself in the third person, even under an assumed name.[50] If then, it was Broderip himself who wrote of "downright enormous dragons," and that "while this was going on upon what passed for dry land, great sea-dragons rushed through the waves, or sported on the surface of an ocean,"[51] it was understandably with the full cooperation of Professor Owen.

In any case, the dragon appellation stuck. In the first place, with a public viewing "life"-sized extinct animals[52] for the first time, an encounter which Brian E. Noble describes as being with

> Monsters . . . multiple blends of organic vision and technological construction, of science and fantasy, of the known and unknown, of mammal and reptile, of ancient and modern, of dragons and "real" beasts, of education and entertainment.[53]

What Owen provided with his taxonomic trick was a soothing resolution between at least one of these dichotomies, one which echoes the approach I have attributed to him in his taxonomic appellation: If there is such a thing as a dragon, it is here. And it is real. Not fantasy, science; not unknown, known; ancient, but revealed by modern knowledge; an important field of study, and a little scary, in an entertaining sort of way. This resolution of the old with the new, the known with the unknown, the need for which was so fervently demonstrated by Robert Hawkins in 1840, allowed for characterization ("Fiend dolorous") of extinct animals. In later examples this was accomplished on the less hyperbolic scale of natural science: by 1882, the guide to Sydenham published by Charles Dickens states:

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> On the chalk-bed are the great Pterodactyles, or wing-fingered dragons, restored from the bones in Dr. Bowerbank's museum; they are the most extraordinary of the extinct animals, active, fierce, and swift in the pursuit of their prey.[54]

Never mind that neither Owen nor the anonymous writer of the guide could make this characterization with much more than a shred of empirical evidence (Owen, T.H. Huxley and H.G. Seeley, among others, would long debate over the true nature of Pterodactyl, including whether they were cold- or warm-blooded),[55] it didn't matter to the public, who could be expected to easily digest a description of a "dragon" as "active, fierce and swift." As Mitchell implies, everyone knows *that*.

Like the "flying reptile, or dragon" of Sydenham, John Martin's frontispiece to *The Book of the Great Sea Dragons*, allows the public to find something recognizable in a new order of technological reproduction—modern primordial imagery. Martin's mezzotint shows the nightmarish prehistoric scenario described by the author: in the right foreground a group of Pterodactyl are depicted in the act of scavenging the carcass of a Teleosaurus, or extinct crocodile; in the left foreground two savage Plesiosaurs attack another Teleosaurus. But is that rearmost monster really a Plesiosaur? A look at many printed reproductions fails to make visible a significant detail that *does* show up in digital reproductions: revealed by the light of the gibbous moon, the rearmost Plesiosaur's huge, elongated body snakes away in vertically undulating s-curves. It's the Great Sea Serpent, out there amidst the dragons.[56]

As noted by Prickett, the picture is a fine example of the influence of paleontology on the art world, which was quick to capitalize on science's new imagery of ancient times, in particular the form of the gigantic dinosaur:

> The weird creatures of James Jefferys (1751–84) or the better-known sea monsters of John Hamilton Mortimer (1740–79) are clearly descended from the half-human species of classical mythology—fauns, centaurs, and tritons. Though they have scales and claws and often tails, their scale is essentially a human one. They even have human faces. In contrast, for the Victorian artists the wildest outsize dreams of the Romantics were suddenly a reality. Images of horror which had always leaned toward the slimy and scaly became more specifically reptilian.[57]

This was clearly seen as a new artistic *oeuvre* even at the time: Prickett further quotes Mantell, who in 1838 published *Wonders of Geology* with Martin's frontispiece "The Country of the Iguanodon," and who refers to Martin as "the most celebrated, most justly celebrated artist, whose wonderful conceptions are the finest production of Modern art."[58]

Despite this contemporary accolade, the dinosaur image in the first part of the nineteenth century is anything but "modern." True, renditions such as de la Beche's and Goldfuss's, produced in the early 1830s sought—if clumsily—to recreate anatomical detail from reports on comparative anatomy of fossil remains; by the end of that decade, however, the "peaceful, pastoral tone" of such works had given way to "the nightmarish 'Gothick' melodrama of the Martinesque style,"[59] so evident in *The Great Sea Dragons as They Lived*. In particular of the Plesiosaur that arches its neck and appears to be hissing and spitting at the left of the picture, Rudwick notes that "the animals are portrayed with scant regard for

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anatomical accuracy and are derived more from the long artistic tradition represented by innumerable paintings of 'Saint George and the Dragon.'"[60]

That the dragon-like qualities of dinosaurs in popular imagery continued on from the Martin tradition (not only in his own work, such as the 1842 frontispiece *The Age of Reptiles*, but also in the work of others such as George Nibbs and Thomas Milner, whose 1846 dinosaur illustration for his own book *Geology* opens the title page like a medieval dragon from an illustrated manuscript),[61] demonstrates how such fabulous artistic conventions can, for a time, become the norm. It is not simply, as Mitchell has suggested, that the dinosaur image arises in a situation where creativity is unfettered by the lack of an artists' model from life, but also that the same lack, in the combined contexts of science (where accuracy is key) and art (where imagination is king) leads to a circulation of styles and approaches. When in doubt, copy someone else's vision. Thus, if "the deep past became, at least for those who wished it so, a profoundly alien realm inhabited by monsters,"[62] they were monsters given their "Gothick" form by existing artistic tradition, which (outside of some very dry scientific texts) was really all the contemporary artist could draw on for inspiration.

This tradition clearly had its effect on Waterhouse Hawkins, whatever dependence he had on advice received from Owen. The Sydenham dragons are, as noted by many writers, essentially monsters cobbled together from various forms of zoological anatomy. In his later work on primordial subjects in America, the influence of artistic tradition on Hawkins's work is even more fully evident: in his 1868 painting, *Cretaceous Life of New Jersey*, he depicts on the far right a resting Pterodactyl, one whose long, thick, reptilian tail, sinewy neck and heavy body give an appearance of an animal unprepared for actual flight, but ready for any knight errant that comes along. In this figure one can clearly see Robert Hawkins's "sooty fiend dolorous."

Interestingly, such characterization of the primordial image was to register some effect with the scientific community, and not only in the form of Owen's "flying dragon." As Mantell further noted of Martin's *The Country of the Iguanodon* (1838):

> [A] country . . . which the magic pen of a Martin . . . has rescued from the oblivion of countless ages, and placed before us in all its hues of nature, with its appalling dragon-forms, its forests of palms and tree-ferns, and all the luxuriant vegetation of a tropical clime."[63]

Of course, Mantell's comment acknowledges the analogous representation, but beyond adding "-forms" to his characterization, his acceptance of the role that the dragon image plays in the popularization of dinosaur imagery seems perfectly quiescent. Again, we see in his choice of phrase the logic of the scientist: as these extinct creatures are (or were) real, surely they are as deserving of the dragon-mantle as any mythic beast?

The Pterodactyl, Owen's "flying dragon," quickly becomes an absolute staple of primordial imagery. The exception to this is of course where the image is meant to depict an ancient epoch in which the Pterodactyl did not live; otherwise, however, it is *almost always* present. In fact, the "flying dragon" in the background sky becomes visual shorthand for "prehistoric," or "primordial." Its

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presence works as a signal to the viewer, alerting him/her to the temporal context of the scene.

This omnipresence naturally leads to quite a variegated range of depictions with regard to the Pterodactyl in particular. Kevin Padian has analyzed the cause-and-effect relationship between science and art in the nineteenth century that brought about a state of permeation between image and scientific concept with regard to this order of animals. In Owen's classification of the Pterodactyl as a reptile (now known to be only partly true), Padian locates the nexus of the influence of science on imagery, and vice versa. He first notes that, rather than the wing configuration now attributed to the order of Pterosaurs, early imagery of Pterodactyls depicted them as bat-winged:

> The consequences of this presumption, which invested nearly 160 years of pictorial reconstructions, were compounded by typological classification as reptiles, which effectively prevented them from being anything other than "lizard-like."[64]

That the Pterodactyl image continued for so long to exhibit this mistaken yet gothic aspect (easily confirmed by perusal of both Padian's and Rudwick's visual examples), leads Padian to the conviction that "it seems to have been as much the reconstructions that set the tone for the science as the other way around."[65]

Padian's analysis, however, omits one sphere of pictorial influence, possibly because he is discussing the effect of the image on scientific, rather than public consciousness. Of the dissemination of these biologically spurious images, he notes:

> The familiar is a departure point for the unfamiliar, and even an inaccurate restoration will succeed if the viewer can associate it with a living model [such as a bat].[66]

True, but the public as audience can be trusted not to limit their range of models to the living, or even the demonstrably real. This made the public of the mid- to late-nineteenth century more than willing to associate prehistoric beasts with dragons, as Professor Owen undoubtedly understood.

Clearly, such a mythic influence was at work with regard to the early nineteenth century scientific study of the primordial. The Austrian botanist Franz Xavier Unger wrote in his 1851 folio atlas *The Primitive World in Its Different Periods of Formation* of "the singular *Pterodactylus* [his italics], whose fantastic form realizes the monstrous being that man's imagination has created under the name of the Flying Dragon."[67] Tellingly, his remark comes in the year of the Great Exhibition, just as plans were being formed for the gardens at Sydenham. If in fact it was Owen's imagination that accomplished this "creation" of the "flying dragon" in the form of a taxonomic appropriation, the move was surely suggested (if not dictated) to him by the influence of what was by then an established artistic practice of visually characterizing certain extinct animals as dragons.

The artistic and public interest in gothic primordial imagery continued into the rest of the nineteenth century in the work of illustrators such as Tenniel, whose Jabberwocky for 1871's *Through the Looking Glass* has "the leathery wings of a Pterodactyl and the long scaly neck and tail of a sauropod."[68] These stylized forms, however, have a tendency (borne out in a variety of like illustrations for Andrew Lang's Fairy Books, for example)[69] to combine features of the dragon

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with increasingly recognizable elements of extinct animals. The transitional process of public fascination is reflected in these visual hybrids, disseminated in the years from about 1870 to 1900, before the dinosaur was able to fully grasp the public's focus.[70] The continuing influence of gothic imagery in the depiction of ancient environments is, in the late nineteenth century, visible in the work of one of the era's most celebrated illustrators, Gustav Doré, who "freely adapted the vast and grotesque images of Martin and Hawkins to suit his needs."[71]

Artistic trends aside, Owen's co-option of the dragon into prehistoric taxonomy has clearly influenced dinosaur hunting, long after his Sydenham dragons have ceased to be recognized as anything more than gothic reconstructions of the science's early efforts.[72] The growing public fascination with awe-inspiring public displays of primordial beasts was one thing: the *scientific* fascination with extinct animals, in Owen's day and for the rest of his century, was largely limited to the community engaged in the various explorations surrounding paleontology. The confirmation of Owen's taxonomic dragon would be advanced within this community just as the public started to take increasingly serious note of the un-hybridized dinosaur image as a visual phenomenon in its own right—that is, as the mythic or archetypal qualities associated with dinosaurs through their visual conception as dragons gradually ceased to require direct visual confirmation. This final phase in the co-opting of the dragon concept into the dinosaur image, however, would not be accomplished by Owen, or in England. While the public curiosity over paleontological display was beginning to catch on by 1854, its popularity would soar with a publicity boost given to the dinosaur image—dragon taxonomy intact—two decades and an ocean away from Sydenham.

New World Dragons

As Mitchell points out, "Dinosaurial fame in America seems to begin not with the bones, but the bone hunters."[73] If Richard Owen is the man most associated with the term "dinosaur," his colleague and admirer Othniel Charles Marsh, chair of paleontology and curator of the Peabody Museum at Yale University, "remains," according to Mark Jaffe, "the prominent namer of dinosaurs, with nineteen genera to his credit. That's five more than anyone else."[74] And no wonder: from the 1870s on, America would come to the explosive realization that not all of her valuable animal resources were living. The emerging fossil record, particularly in the West, would dwarf in quality, quantity and variety the finds of all the European nations together. O. C. Marsh was—quite literally—right in the thick of things, and his exploits along with those of his great rival, Edward Drinker Cope, would put dinosaurs on the front page.

In the Spring of 1870, Professor Marsh led a group of Yale students on a bone hunting expedition to the Wyoming/Colorado border and into Kansas, the first of four successive annual trips, during which the well-publicized exploits of the intrepid scientist "launched American vertebrate paleontology into its heroic period."[75] The adventures of the rough-and-ready bone hunters were published in the New York *Weekly Herald* and *Harper's New Monthly Magazine*, and made thrilling reading as the group ventured into hostile Indian country in search of ancient monsters.[76]

That first year, he made "the most remarkable discovery of his life,"[77] one that he would not be able to confirm until 1871: while riding along a trail near

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the Smoky Hill River in western Kansas, he noticed a small bone near the edge of the trail and collected it. As both the day and the expedition were coming to an end, he marked the spot with a large cross, hoping to return to it the following year. As it turned out, the bone represented something unheard of: as far as Marsh could tell it was the finger bone of a Pterodactyl, of which drawings and specimens were then available only from Europe. In fact, Marsh had been to the continent and had seen such specimens first-hand.[78] The problem was, the Pterodactyl known from European fossils were swallow-sized; this bone would have come from a much, much larger creature. In his initial report on the bone, Marsh reveals the lasting power of Richard Owen's taxonomy:

> The only joint much like it that I could find, in any animal, living or extinct, was in the wing finger of the Pterodactyl, or flying dragon.[79]
> [and]
> After further comparison . . . I could only return to the dragon's wing for the nearest resemblance.[80]

Marsh calculated the animal's wingspan at twenty feet, "Truly a gigantic dragon even in this country of big things."[81] In the issue of *American Journal of Science* for June of 1870 he published an article entitled "Note on a New and Gigantic Species of Pterodactyl."[82] In his memoirs Marsh writes of the day he returned to gather up the rest of the Pterodactyl bones from the site:

> These I measured roughly as I took them up one by one, and . . . I was soon able to determine that my calculations based on the fragments were essentially correct, and that my first found American dragon was as large as my fancy had painted him. My journey from New Haven was amply repaid, but greater rewards were to come, for during the month that I spent at hard work in this region, other dragons came to light, even more gigantic and much more wonderful than I had before imagined.[83]

Here we see Owen's taxonomic reference being passed down in the literature of paleontology. I will also point out that Marsh had to give his dragon an official taxonomy, too; he named it *Pterodactylus owenii*.[84]

Marsh's dragon was but the first of many American Pterodactyl species to be identified, and it is significant to the story of his career that an even larger one, *Pterodactylus umbrosus*, with a twenty-five foot wingspan, was discovered not by Marsh, but by E. D. Cope.[85]

The story of their bitter rivalry is covered at length elsewhere, but suffice to say that it falls into the category of seething professional jealousy, and revolves primarily around taxonomic issues—specifically, who found it first, and who gets to name what. In the beginning of their competition for fossil finds, this rivalry took the form of a race—a physical dash to the fields of the west, which had each man trying keep the other's employed diggers one step behind, and which led Marsh's men to go so far as to smash uncollected bones in order to render them useless to Cope.[86] It was also a publishing race that escalated by the 1890s into a full-fledged attempt by each to discredit the findings of the other.[87] As a catalyst to this last, which brought the Cope-Marsh feud into the newspaper headlines, the bone hunters would need something colossal.

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The first bones of the truly gigantic sauropods were identified at Morrison, Colorado early in 1877, and purchased by Marsh. Soon after, Cope's collectors obtained similarly massive bones for him about a hundred miles south.[88] Although each scientist knew that he had something on a never-before-seen scale in his possession, it was not until a treasure trove of such bones was located that either would realize their true significance. Over the next twelve years, thousands of tons of dinosaur bones, especially sauropods like Apatosaurus and Brachiosaurus, would be dug out of Como Bluff, Wyoming, many of them by the man who first reported them—William H. Reed, a former buffalo hunter and railroad man.[89] Reed worked for Marsh, but Cope employed his own collectors in the area, and the taxonomic race intensified. The Cope-Marsh feud had long since reached a boil, with each accusing the other of plagiarism and downright theft, charges both amplified and parodied for the public in the pages of the 1890 New York *Herald*:

> BATTLE OF THE SCIENTIFIC GIANTS STILL BEING WAGED
> Professor Cope recently threw his red hot shot onto the camp of Major Powell. All of the world was at once agog. Cope is not a trifler. He meant business, and there was blood on the face of the moon. He made charges against [U.S. Geological Survey Head John Wesley] Powell and Marsh which can never be forgiven—that the one was an incompetent and the other a plagiarist.[90]

These inflammatory and inflamed charges went on for weeks, and were never forgiven or forgotten. Cope died in 1897. Marsh survived him for less than two years. Both would miss by a brief margin the remarkable modern phenomenon that their discoveries would unleash as the turn of the century approached, and "'dinomania' finally erupted in the sensationalist press."[91]

Between them, Marsh and Cope had identified several species of dinosaurs, Pterodactyl and extinct reptiles, the ongoing discoveries of which were duly published in scientific journals and in the occasional newspaper story, with the latter often focusing, as I've noted, on the derring-do of the bone prospector in the wild west.[92] As it turns out, however, when it comes to dinosaur publicity, size does matter.

"MOST COLOSSAL ANIMAL EVER ON EARTH JUST FOUND OUT WEST," ran the headline for the *New York Journal and Advertiser* December 11, 1898.[93] The story featured "Bill Reeder" (William Reed) standing next to one of the massive sauropod bones dug out of Como Bluff. This remarkable, full-page sensation emphasized and embellished size at every opportunity:

> WHEN IT ATE IT FILLED A STOMACH LARGE ENOUGH TO HOLD THREE ELEPHANTS.
> ITS TERRIBLE ROAR COULD BE HEARD FOR TEN MILES[94]

If size was the public draw, the article was even more significant in that it exemplified the completed transition of the extinct animal in the public sphere. There is by this point no overt tie to the mythic, the sea serpent or the dragon. Anatomical specifications and a sketch of the reconstructed skeleton are included along with photos of a fossilized skull and footprints. And thus, the dragon, having been co-opted by Owen, becomes a thoroughly modern beast in the form of this prehistoric giant, who is shown standing upright in the streets of

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New York, with the caption: "How the Brontosaurus Giganteus Would Look if it Were Alive and Should Try to Peep into the Eleventh Story of the New York Life Building."[95]

Among the imaginations being fired by dinosaurs was that of America's richest and most prolific philanthropist, Andrew Carnegie. In 1898, just weeks before Marsh's death, Carnegie's attention was grabbed by the December 11 *Journal* article, and he immediately set out to buy one of the enormous skeletons for display at the recently established Carnegie Institute.[96] Carnegie's acquisition would in many ways be the world's, and would bring the dinosaur image before many more people, in more nations, than had ever before been possible. Plaster reconstructions of *Diplodocus carnegii* were shipped to governments and museums in Europe, Russia and Mexico, and "introduced millions to their first sight of a dinosaur."[97]

Growing public fascination spurred more publication: the years around the turn of the century saw the first book-length treatments of paleontology for the general reader, such as the Reverend Hutchinson's *Extinct Monsters* and *Creatures of Other Days*.[98] Clearly intending his books for a popular audience, Hutchinson compares his distillation of scientific information to "skimming samples of cream from many bowls of milk," noting that "it is only the cream that the general public require." For those of an unscientific nature, he assures readers that "[a]ll technical details, such as the general reader is unfamiliar with, will be as far as possible suppressed."[99]

One aspect of *Extinct Monsters* is worth noting: in true Owenian tradition, Hutchinson's lowbrow science is littered with dragons. Chapter eleven, on the Pterodactyl, is of course titled "Flying Dragons." Chapter eight, on the dinosaurs, goes by "Dragons of Old Time;" chapter ten, "Sea Serpents." The scientific logic that I attributed to Owen and Mantell shows up in Hutchinson's careful explanation of the terms, contained in the epigraph that opens this essay. He further cements the inclusion of the dragon in the visual and conceptual characterization of his extinct monsters by claiming of dinosaurs that their "formidable coat[s] of armour" gave them "a decidedly dragon-like appearance." And finally, the *coup de grace*:

> And yet it is no fairy-tale land after all, where impossible things happen, and where impossible dragons figure largely; but only the same old world in which you and I were born. Everything you will see here is quite true. All these monsters once lived. Truth is stranger than fiction; and perhaps we shall enjoy our visit to this fairy-tale land all the more for that reason. For not even the dragons supposed to have been slain by armed knights in old times, when people gave ear to any tale, however extravagant, could equal in size or strength the real dragons we shall presently meet with, whose actual bones may be seen in the Natural History Museum at South Kensington.[100]

Owen's taxonomic trick has, in Hutchinson's popular work, become a monstrous conundrum of ambiguity: the primordial isn't a fairy world, but it is; dragons are the myths of "old time;" dinosaurs are the dragons of "old time." The mythic and the primordial here continue to fold in upon each other, becoming one. As a work of popular science, Hutchinson's book helps to demonstrate the rapidly growing public interest in a prehistoric world that now definitely contains monsters—not fairy tale monsters, but real ones.[101] As a continuation (and

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amplification) of Owen's taxonomy, the dragons of primordial "old time" no longer need the gothic visual elements of earlier visual representations. The discovery of a Tyrannosaur and the uncovering of a nearly complete Allosaur skeleton in 1902, both recorded by Hutchinson in his second edition, bring into the public awareness dinosaur images that are active, swift and fierce enough without artistic embellishment. The public is ready to accept their dragonhood just as they are.

Hutchinson's book was not alone: in 1901, Owen's old rival H. G. Seeley produced his definitive argument on the nature of the Pterodactyl. Not wanting, one imagines, to copy any taxonomic allusions directly from Owen, Seeley eschewed "flying dragon" when selecting a title. He called his book *Dragons of the Air*. In the face of popular science publicity such as Hutchinson's and Seeley's for the dinosaur and its image, the growth of public interest in "prehistoric fiction" seems almost a natural consequence of the extinct animal's journey from "flying dragon" to "NEW YORK'S NEWEST, OLDEST, BIGGEST CITIZEN."[102] Yet while the dragon elements of dinosaur imagery had been entirely subsumed by the extinct animals, the analogy spurred by Owen's taxonomy continued. Five years after the re-opening of the Carnegie Institute, Sir Arthur Conan Doyle would write in *The Lost World* of his scientists' exaltation at the discovery of living Pterodactyls:

> Our professors would gladly have stayed there all day, so entranced were they by this opportunity of studying the life of a prehistoric age. They pointed out the fish and dead birds lying out among the rocks as proving the nature of the food of these creatures, and I heard them congratulating each other on having cleared up the point why the bones of this flying dragon are found in such great numbers in certain well-defined areas, as in the Cambridge Green-sand.[103]

Owen's taxonomy had by 1912 found its way fully into the popular vernacular, and in the public mind the existence of dragons was confirmed in the imagined presence of living dinosaurs.

In the twenty-first century, both scientific discovery and increasingly sophisticated imagery have if anything strengthened our overall knowledge of and connection to dinosaurs. The paleontological world has entertained round after round of debate over issues of reconstruction, scientific interpretation, and just what these animals looked like. Meanwhile, in over a century of cinema and its antecedent media branches, the dinosaur image has been a nearly constant companion —onward from 1925's adaptation of Conan Doyle's *Lost World* and touching the advent of several major technological developments (improved stop motion animation with 1933's *King Kong*; CGI with 1993's *Jurassic Park*, RealD 3D with 2008's *Journey to The Center of the Earth*). If our understanding of dinosaurs, however, revolves in part around 20th-century mythologies of time travel, lost worlds and subterranean realms, it is also rooted even further back in history, in the nineteenth century, at the point where the dragon and the dinosaur were brought into convergence.

On the one hand, the story of Professor Owen's "flying dragon" demonstrates in detail some of the ways in which scientific discovery can depend on even deeply held cultural traditions in bringing new and even revelatory knowledge to light. More specifically, it illustrates the often erroneous assumption that connections between the dragon and the dinosaur are an accident of social discourse, or

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that Mitchell's "big, fierce, extinct reptiles" can only be understood as we see them today. Once, and not too long ago, the bridge to public understanding of the primordial world was populated by mythic monsters. The crossing of that bridge—the encounter with those monsters—is a seminal and an influential episode in that history.

Endnotes

The bulk of the research for this article was carried out during completion of my doctoral dissertation (University of Melbourne, Australia, 2005). Further work has been supported by the University of New Orleans. I would like to thank Henry Griffin for his suggestion that this small piece of a much larger research project would be suitable for journal publication. Dr. Petra Nolan provided invaluable assistance with editing, and advice on what can be the painful process of extracting one work from another. Shana Hartmann has, since the inception of my research, provided unwavering support, and I dedicate this essay to her. Address correspondence to John McGowan-Hartmann, Department of Film, Theatre and Communications Arts, University of New Orleans, New Orleans, LA 70148. Email: jmcgowan@uno.edu.

1. Rev. N. H. Hutchinson, *Extinct Monsters and Creatures of Other Days*, Revised ed. (London, 1910), xvii.

2. William J. Broderip, *Zoological Recreations* (London, 1847), 327.

3. W. J. T. Mitchell, *The Last Dinosaur Book* (Chicago, 1998), 11. Mitchell finds that dinosaurs' "linkage with dragons and other reptilian monsters at the level of visual representation is manifest" to such a degree that any links between the conceptual meanings borne by the dragon image and the dinosaur image are indistinguishable when based on general categories: "between science and magic, [or] the modern and the savage mind." In his laudable effort to "put" dinosaur imagery on the "map of artistic genres," he acknowledges that the dinosaur and the dragon in imagery share the quality of a "constructed image," one that cannot be modeled from life, but must rely on a combination of textual information and imagination. However, he finds the dinosaur image to be somewhere between the real and the fantastic, whereas "[m]ythical creatures like the dragon . . . may require less imaginative work because there are no independent visual or non-visual criteria of 'rightness' to be observed . . . as . . . in scientific illustration," 55. Since his discussion of a formal relationship between the dragon image and the dinosaur image remains at the esoteric, general level, and can be considered somewhat dismissive, my question becomes: how specifically did such a relationship come about? How does it behave? What, if anything, is its function? And why is this important?

4. "King Kong: Ape and Essence," in *Interpreting the Moving Image* (Cambridge, 1998), 119–20.

5. Nicolaas A. Rupke, *Richard Owen: Victorian Naturalist* (New Haven and London, 1994), Chronology, xv. The other prominent biography of Owen was written by his grandson, and tends a little too far to the subjective. Reverend Richard Owen, *The Life of Richard Owen by His Grandson, With the Scientific Portions Revised by C. Davies Sherborn*, 2 vols. (London, 1894).

6. Ibid.

7. Ibid.

8. For renewed certainty on the exact circumstance and date of the first use of the term by Owen, see Hugh Torrens, "When Did the Dinosaur Get Its Name?," *New Scientist* 134, no. 1815 (1992). Rupke notes that although both the Iguanodon and Hylaeosaurus had been

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discovered and named by Gideon Mantell several years earlier: "[b]y inventing the dinosaurs, coining the name and placing them in a taxonomic category of their own, Owen appropriated Mantell's sensational monsters. From that time on, it would always be Owen's name, more than Mantell's, that was remembered when the mighty monsters were mentioned," 134.

9. See Ibid, 256–58. For example, Owen argued against fundamental aspects of Darwin's theory of evolution and natural selection for many years, at the last not because he conceptually disagreed with it on scientific grounds, but because of its theological implications, and because it countered, or even nullified earlier scientific findings of his own.

10. Many contemporary accounts capitalize (Great) Sea Serpent, and refer to "him" as a familiar personage ("The Latest of the Sea Serpent!" [*Times*, September 18, 1850, 8, col. A]). Although capitalization was clearly disseminated with a freer hand at the time, the suggestion of a proper noun is there.

11. The best and most scrupulously detailed account of sea serpent sightings and the arguments spawned by their reportage is R. T. Gould, Lt. Cmdr. R.N. (retired), *The Case for the Sea-Serpent* (Detroit, 1930). See also, Rupke, *Richard Owen*, 324–32, for a detailed account of Owen's involvement with the Sea Serpent story. Also useful is Bernard Huevelmans, *In the Wake of the Sea-Serpents* (New York, 1968).

12. Hans Egede, *A Description of Greenland* (London, 1745), quoted in Gould, 13.

13. Gould, *The Case for the Sea-Serpent*, 139.

14. Ibid, 98–99, also Rupke, *Richard Owen*, 325.

15. For a selection of *Times* articles on the Great Sea Serpent: January 22, 1849, 8 col. E; July 09, 1849, 8 col. E; April 16, 1850, 7 col. F; April, 28, 1850, 5 col. F; August 21,1850, 5 col. C; August 24, 1850, 6 col. D *and* 8 col. C; September 03,1850, 4 col. F; September 18, 1850, 8 col. A; September 25, 1850, 5 col. A ("THE VERY LAST OF THE SEA SERPENT"); November 17, 1852, 6 col. C; February 16, 1855, 8 col. D ("THE SEA SERPENT ONCE MORE"). This is not an exhaustive list, but it is an amusing group of pieces. Both Gould and Rupke acknowledge coverage in other metropolitan and local papers. By November 27, 1855, 5 col. E, the *Times* carried a comment on the then fledgling Australian wine industry: "Industries that potter on in the state of infancy for a generation are apt to be slighted and forgotten; dwelling continually in the region of expectation and promise, they rank at last with the sea serpent."

16. Rupke, *Richard Owen*, 324–25.

17. Gould, *The Case for the Sea-Serpent*, 107.

18. Rupke, *Richard Owen*, 325–32.

19. Ibid., in particular 132–33. Owen drew his theologically sound concept of antediluvian life from the work of Georges Cuvier. The debate over evolution, which Owen came to largely accept (scientifically if not publicly) later in his career, was a major cause of his professional feud with the anatomist T.H. Huxley. See Adrian Desmond, *Archetypes and Ancestors: Palaeontology in Victorian London 1850–1875* (Chicago, 1982).

20. Hugh S. Torrens, "The Dinosaurs and Dinomania over 150 Years," in *Vertebrate Fossils and the Evolution of Scientific Concepts*, ed. William A. S. Sarjeant (Adelaide, 1991), 255–83, esp. 275–76.

21. Stephen Prickett, *Victorian Fantasy* (Hassocks, Sussex, 1979), 80. Prickett provides a commendably succinct summary of the theological debate raised by geology and paleontology, for which I am indebted.

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22. Ibid. Cuvier based his ideas about extinction on "a pair of jaws over four feet long, that had been dug up in a chalk mine at Maestricht in 1770," and that eventually proved to belong to what he named the Iguanodon. Thus, ideas of "deep" or geologic time entered public consciousness hand in hand with monsters. The term "paleontology," directly related to geology, translates from the Greek as "ancient beings discourse."

23. Martin J. S. Rudwick, *Scenes From Deep Time: Early Pictorial Representations of the Prehistoric World* (Chicago and London, 1992), 59.

24. Torrens, "Dinomania," 266.

25. Rudwick, *Scenes From Deep Time*, 59.

26. T. Lingham-Soliar, "Art in Science: Introduction," in *Vertebrate Fossils and the Evolution of Scientific Concepts*, ed. William A. S. Sarjeant (Adelaide, 1995), 87. Mitchell echoes her sentiment: "Perhaps more than any of the other historical sciences, paleontology requires the aid of visual artists and illustrators to depict in concrete, visible form what the scientist conceives in the imagination," 55.

27. Rupke, *Richard Owen*, 327.

28. Ibid.

29. Ibid. Rupke quotes from Owen, *Life*. v. I, 334. Owen was well acquainted with the royals, and had given lectures to the Queen, Albert and their household, 187.

30. Ibid., 135.

31. Ibid.

32. Ibid. Rupke here quotes Owen, writing enthusiastically in praise of himself in the third person. See note 50.

33. Mitchell, *The Last Dinosaur Book*, 95. I would counter that there is nothing "living" in the display. These are dead monsters, and meant to be seen as such.

34. Mitchell cites an average of 2 million visitors per year until 1900, 128.

35. Rupke, *Richard Owen*, 131–32. It was actually the Prince Consort who suggested to Paxton that the statues should be created for the Sydenham site, and "Owen was the obvious expert whom to turn to for consultation by the commissioned sculptor."

36. *Guide to the Palace and Park*, (London, 1882), 24.

37. Richard Owen, *Geology and Inhabitants of the Ancient World* (London, 1854). Accessed through American Library Association, *The Books of the Fairs: Material About World's Fairs, 1834–1916, in the Smithsonian Institution Libraries*. (Chicago and London, 1992), 70. The guidebook was available to the general public for three pennies (Rudwick, *Scenes From Deep Time*, 44).

38. Owen, *Geology and Inhabitants*, 11. My italics. The spelling of "Pterodactyl," as well as the classification of the extinct orders of flying reptiles, has undergone revision since 1854.

39. Dennis R Dean, ed., *The First "Dinosaur" Book: Richard Owen on British Fossil Reptiles (1842)* (Delmar, N.Y., 1999), 14.

40. See Desmond.

41. Kevin Padian, "Pterosaurs and Typology: Archetypal Physiology in the Owen-Seeley Dispute of 1870," in *Vertebrate Fossils*, 285–98.

42. Hawkins, *Sea Dragons*, 1: "*The Flood-The Backbones of the Globe broken, from the Poles downward-The Boulders and other drift found over all the Earth in a certain line, show the*

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manner and Universality of the Deluge—The Ark admitted only the domestic Races of Animals-Scripture quoted in proof thereof-Recapitulation." (His italics.)

43. Ibid., 22.

44. Ibid., 27.

45. Ibid., 26.

46. Ibid.

47. Ibid., 28:

"The Niagaras of Time too, falling each a tremendous Ocean from one System to another, over the Universe from the Lap of hoary Eternity,—we hear them Roar.

Maleficent wings, leathery, carefully glazed and strung in Hell, overshadowing the ugly Aborigines of the watery world, Serpents all,—we behold.

And over them all, and above all, inaccessible to the loftiest flight of the Halcyon Soul, in far immensity, alone, Jehovah, blessed be His Holy Name, whom we worship and adore."

48. 5, col. D.

49. Rupke, *Richard Owen*, 134. Again, Rupke quotes from Owen, *Life*, vol. I, 373-4. To be fair to Owen, the summary ended up requiring two issues of the *Review*.

50. Ibid., 135. See note 32.

51. Broderip, *Zoological Recreations*, 327.

52. Torrens notes that by the time of the Crystal Palace statues, Owen's "three dinosaur genera, which had been considered up to 200 feet long, were now cut down to size," at around thirty feet each. The Pterodactyls were modelled at a larger-than-life scale, so as to be visible in detail across the lake, "Dinomania," 273.

53. Brian E. Noble, "Dinosaurographies: The Public Politics of Monstrous Fascination," (Master's, University of Alberta, 1994), 42.

54. *Guide to the Palace and Park*, 26.

55. Rupke, *Richard Owen*, 253. The warm-blooded theory was advanced by H.G. Seeley, a geologist at King's College, and grew out of Owen and Huxley's arguments over the relationship (if any) between bipedal dinosaurs and flightless birds. The dearth of specimens at the time led to constant errors that would only be corrected as more were unearthed, such as the claw or thumb bone that B. Waterhouse Hawkins mistakenly placed on the nose of the iguanodon figure as a horn, or the same figure's quadrupedal positioning, which later proved incorrect. See also Mitchell, ch. 10.

56. For example, the sea serpent body is not visible in the reproduction printed in Rudwick, *Scenes From Deep Time*, 83. Digital image retrieved at *The Book of the Great Sea Dragons*, accessed July 8, 2004, http://www. plesiosaur.com/references/sea-dragons/front. htm.

57. Prickett, *Victorian Fantasy*, 82–83.

58. Ibid., 83.

59. Rudwick, *Scenes From Deep Time*, 80.

60. Ibid.

61. Ibid., 85, 91.

62. Ibid., 95.

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63. Quoted in Ibid., 78.

64. Kevin Padian, "The Case of the Bat-Winged Pterosaur: Typological Taxonomy and the Influence of Pictorial Representation on Scientific Perception," in *Dinosaurs Past and Present*, ed. Sylvia J. Czerkas and Everett C. Olson (Los Angeles and Seattle, 1987), 65–80.

65. Ibid., 79.

66. Ibid.

67. *Die Urwelt in ihren verschiedenen Bildungsperioden*, quoted in Ibid., 118.

68. Prickett, *Victorian Fantasy*, 83.

69. Ibid.

70. Prickett notes that this hybridity of dragon and dinosaur is also exhibited in period literature, and cites the remarkable example of E. Nesbit's 1900 children's fantasy *The Book of Dragons*, which features "concrete replicas of dinosaurs" that come magically to life as "dragons as they lived in men's memories," quoted in Ibid., 88–89.

71. Ibid., 89.

72. For a more recent example, see Christopher McGowan, *Dinosaurs, Spitfires and Sea Dragons*, 2 ed. (Cambridge, MA and London, 1991). The first edition is entitled *The Successful Dragons: A Natural History of Extinct Reptiles* (Toronto, 1983.)

73. Mitchell, *The Last Dinosaur Book*, 134.

74. Mark Jaffe, *The Gilded Dinosaur: The Fossil War between E. D. Cope and O. C. Marsh and the Rise of American Science*, First ed. (New York, 2000), 381. The Cope-Marsh rivalry, or feud, or scandal, continues to fascinate scholars in terms of its implications for palaeontology, American scientific history, and the cultural impact of scientific discovery. For this discussion I am most indebted to Jaffe's work as well as David Rains Wallace, *The Bonehunters' Revenge: Dinosaurs, Greed and the Greatest Scientific Feud of the Gilded Age* (Boston and New York, 1999); and Url Lanham, *The Bone Hunters* (New York and London, 1973).

75. Lanham, *The Bone Hunters*, 90.

76. Ibid., 80. The trip had to be postponed from 1869 due to "a flare-up of Indian hostilities," a problem which continued to plague bone hunters in the West until late in the century. Marsh himself interfered on behalf of Indians who were suffering under government "protection," and befriended the Sioux chief Red Cloud, who visited him in New Haven, 149–53.

77. Ibid., 84.

78. Wallace, 28–30. Marsh travelled and studied in Europe from 1862-65, after earning his Master's from Yale.

79. Quoted in Jaffe, *The Gilded Dinosaur*, 52.

80. Quoted in Wallace, *The Bonehunters' Revenge*, 62.

81. Quoted in Jaffe, *The Gilded Dinosaur*, 53.

82. Ibid.

83. Quoted in Wallace, *The Bonehunters' Revenge*, 68.

84. Jaffe, *The Gilded Dinosaur*, 53.

85. Ibid., 73.

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86. Ibid., 154–57. Also, Lanham, *The Bone Hunters*, 174–84.

87. Ibid., prologue and ch. 10.

88. Tom Rae, *Bone Wars: The Excavation and Celebrity of Andrew Carnegie's Dinosaur* (Pittsburgh, 2001), 14.

89. Lanham, *The Bone Hunters*, 174–84.

90. Quoted in Wallace, *The Bonehunters' Revenge*, 251.

91. Ibid., 281.

92. See note 76.

93. Wallace, *The Bonehunters' Revenge*, 281. See also Rea, 31 ff.

94. Ibid.

95. Rea, 31. The name of the creature is a fabrication, and in fact Marsh's brontosaur has turned out to be a misidentified Apatosaur. See Jaffe, 249-50.

96. Rea, 31–41. During the intervening years Marsh's health had declined rapidly, and he had long since ceased his wild west trips. The expanded Institute was opened in 1907, 198.

97. Ibid., 216.

98. The revised edition reprints in a single volume two earlier works, published in 1892 and 1894, respectively. Hutchinson is quick to thank the reading public for the large sales of the originals.

99. Ibid., 3. Hutchinson was a progenitor of what came to be called "popular science," and in 1896 had followed up his two earlier works with *Prehistoric Man and Beast* (London), which he prefaced by writing, "This is a book intended for everybody, not for the specialist either in Geology or Archaeology," ix. Of *Extinct Monsters*, a review from the *Guardian*, included in the later work, states: "If the popularity of extinct monsters has of late not been quite what it once was, it ought to be revived by Mr. Hutchinson's excellent book," afterleaf.

100. Ibid., 2.

101. "How seldom do we think," writes Hutchinson disingenuously in his 1910 preface to the revised edition, "of that innumerable host of creatures that once trod this earth!" Such thoughts, having helped sell out the original editions (for which Hutchinson thanks his public), were apparently occurring far from "seldom."

102. For a breakdown of the remarkable rise in the sales of "prehistoric fiction" during this era, see Marc Angenot and Nadia Khouri, "An International Bibliography of Prehistoric Fiction," *Science Fiction Studies* 8, no. 1 (1981): 38–53.

103. *The Annotated Lost World*, ed. Roy Pilot and Alvin Rodin, First ed. (Indianapolis, 1996), 129.

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